CLAIMS

1. A system for measuring oxygen uptake in a human or veterinary patient, said system comprising:

an inspiratory flow conduit for delivering a flow of inspiratory gas to the lungs of the patient;

an expiratory flow conduit for carrying expired gas from the lungs of the patient;

a ventilation apparatus attached to the inspiratory flow conduit for moving inspiratory gas through the inspiratory flow conduit toward the lungs of the patient; and,

a spirometric device comprising a chamber, which contains a volume of oxygen and an indicator for indicating changes in the volume of oxygen contained within the chamber;

the spirometric device being connected to the ventilation circuit such that the volume of oxygen contained in the chamber will vary relative to the volume of oxygen taken up by the patient.

2. A system according to Claim 1 further comprising a carbon dioxide absorber connected to the system such that gas from the expiratory flow conduit will pass through the carbon dioxide absorber where carbon dioxide will be removed from the gas and the gas will subsequently flow from the carbon dioxide absorber into the inspiratory flow conduit

3. A system according to Claim 1 further comprising a valve positioned between the spirometry device and the expiratory flow conduit, said valve being open only during a late portion of the expiratory phase of the ventilation cycle, thereby preventing substantial pressure variations within the spirometric device as a result of inhalation and exhalation.

4. A system according to Claim 3 wherein the valve is adapted to be opened and closed in response to control signals and wherein the system further comprises a control device which sends control signals to the valve to cause the valve to open and close at predetermined points on the ventilation cycle.

5. A system according to Claim 4 wherein the controller is operative to cause the valve to open at approximately the end of each expiration and to close at approximately the beginning of each inspiration.

6. A system according to Claim 1 further comprising a source of make-up oxygen connected to the ventilation circuit.

7. A system according to Claim 6 further comprising a flow control apparatus for controlling the flow of make-up oxygen into the ventilation circuit.

8. A system according to Claim 7 wherein the flow control apparatus is adapted to increase or decrease the flow of make-up oxygen into the ventilation circuit in response to control signals and wherein the system further comprises a control device which sends control signals to the flow control apparatus to increase or decrease the flow rate of make-up oxygen into the ventilation circuit.

9. A system according to Claim 8 wherein the controller is operative to cause the flow control apparatus to increase or decrease the flow of make-up oxygen as required to prevent more than a predetermined amount of change in the volume of oxygen contained in the cylinder.

10. A system according to Claim 1 wherein the spirometric device comprises a water sealed spirometer.

11. A system according to Claim 1 wherein the spirometric device comprises a dry sealed spirometer.

12. A system according to Claim 1 wherein the chamber moves in relation to the volume of oxygen contained within the chamber and wherein the indicator comprises an indicator of chamber movement.

13. A system according to Claim 12 wherein the indicator comprises a scale marked on the chamber to indicate the distance by which the chamber has moved.

14. A system according to Claim 1 wherein the ventilation apparatus comprises a bag, ventilator, bellows or other manual or automatic ventilating apparatus.

15. A system according to Claim 1 wherein the ventilating apparatus returns to the same volume prior to each breath.

16. A method for determining oxygen uptake in a human or veterinary patient, said method comprising the steps of:

A. providing a closed ventilation circuit that comprises i) an expiratory flow conduit for carrying expired gas from the lungs of the patient, ii) a ventilation apparatus attached to the inspiratory flow conduit for moving inspiratory gas through the inspiratory flow conduit toward the lungs of the patient and iii) a spirometric device comprising a chamber which contains a volume of oxygen and an indicator for indicating changes in the volume of oxygen contained within the chamber, wherein the spirometric device is connected to the expiratory flow conduit such that the volume of oxygen contained in the chamber of the spirometric device will vary relative to the volume of oxygen taken up by the patient;

B. connecting the ventilation circuit to the patient such that the patient will inhale and exhale through the ventilation circuit and

C. determining the change in the volume of oxygen contained in the chamber of the spirometric device as an indication of oxygen uptake by the patent.

17. A method according to Claim 16 wherein the ventilation circuit provided in Step A further comprises a carbon dioxide absorber for absorbing at least some of the carbon dioxide contained in respiratory gas expired by the patient.

18. A method according to Claim 16 wherein the spirometric device provided in Step A comprises a water seal spirometer.

19. A method according to Claim 16 wherein the spirometric device provided in Step A comprises a water seal spirometer.

20. A method according to Claim 16 wherein the ventilation circuit is connected to a source of make-up oxygen from which oxygen is infused into the ventilation circuit and wherein the Step C comprises:

adjusting the amount of oxygen that is infused into the ventilation circuit such that the volume of oxygen in the chamber of the spirometric device does not change substantially; and

determining the volume of oxygen that has been added to the ventilation circuit as an indication of the amount of oxygen that has been taken up by the patient.

21. A method according to Claim 16 wherein the ventilation circuit provided in Step A further comprises a valve positioned between the spirometric device and the ventilation circuit such that when the valve is open the chamber of the spirometric device is in fluidic communication with the ventilation circuit and when the valve is closed the spirometric device is not in fluidic communication with the ventilation circuit, and wherein the method further comprises the step of:

opening and closing the valve at differing times in the ventilation cycle to prevent substantial pressure or movement variations within the chamber of the spirometric device.

22. A method according to Claim 21 wherein the valve is open only during the late expiratory portion of the ventilation cycle